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Government of Canada Fixed-Income Market Ecology

Léanne Berger-Soucy, Corey Garriott and André Usche

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Government of Canada Fixed-Income Market Ecology

by

Léanne Berger-Soucy,[1] Corey Garriott[1] and André Usche[2]

[1] Financial Markets Department
[2] Financial Stability Department
Bank of Canada
Ottawa, Ontario, Canada K1A 0G9
LBerger-Soucy@bankofcanada.ca
cgarriott@bankofcanada.ca
ausche@bankofcanada.ca

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This paper is the third in a series about financial markets in Canada published by the Financial Markets Department. The other papers in the series are:

1. **Canadian Repo Market Ecology** by Corey Garriott and Kyle Gray, Bank of Canada Staff Discussion Paper No. 2016-8.
2. **A Primer on the Canadian Bankers' Acceptance Market**, by Kaetlynd McRae and Danny Auger, Bank of Canada Staff Discussion Paper No. 2018-6

Abstract

This discussion paper is the third in the Financial Markets Department's series on the structure of Canadian financial markets. These papers are called "ecologies" because they study the interactions among market participants, infrastructures, regulations and the terms of the traded contract itself.

In this ecology, we discuss the Government of Canada's domestic fixed-income market. We begin with an overview of Government of Canada securities and their characteristics. We then outline common market practices and the typical participants in the market. We provide high-level statistics on activity in the market and describe the market infrastructures that support trading. Finally, we discuss risks in these securities markets.

Bank topics: Financial markets; Debt management; Financial institutions; Financial services
JEL codes: G10, G20, H63

Résumé

Le présent document d'analyse est le troisième d'une série sur la structure ou l'« écologie » des marchés financiers canadiens rédigée par le département des marchés financiers. On parle d'écologie en ce sens où la série porte sur l'étude des interactions entre les participants au marché, les infrastructures, la réglementation applicable et les conditions des contrats mêmes négociés sur ce marché.

Dans ce document-ci, nous nous intéressons au marché intérieur des titres à revenu fixe du gouvernement du Canada. Après un survol des titres émis et de leurs caractéristiques, nous décrivons les pratiques courantes et les acteurs habituellement présents sur ce marché. Nous présentons des statistiques générales sur l'activité et décrivons les infrastructures qui sous-tendent les transactions. Enfin, nous analysons les risques associés à ce marché.

Sujets : Marchés financiers ; Gestion de la dette ; Institutions financières ; Services financiers
Codes JEL : G10, G20, H63

Executive summary

- *Government of Canada (GoC) marketable securities (hereafter "securities") are issued to provide the federal government with funding for its spending, investment and cash-management purposes.*
- *These securities are low-risk, liquid deposits of funds that earn interest and are the most common source of collateral in Canadian securities-financing markets.*
- *GoC securities are used as benchmarks for pricing Canadian-denominated, fixed-income securities.*
- *GoC securities are issued through auctions held by the Bank of Canada in the primary market. These securities are mostly traded bilaterally on electronic platforms and over the phone in the secondary market.*
- *As of December 31, 2017, the amount of GoC securities outstanding was $690 billion, and the annual trading volume was $11 trillion.*[1]

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[1] Source: Market Trade Reporting System

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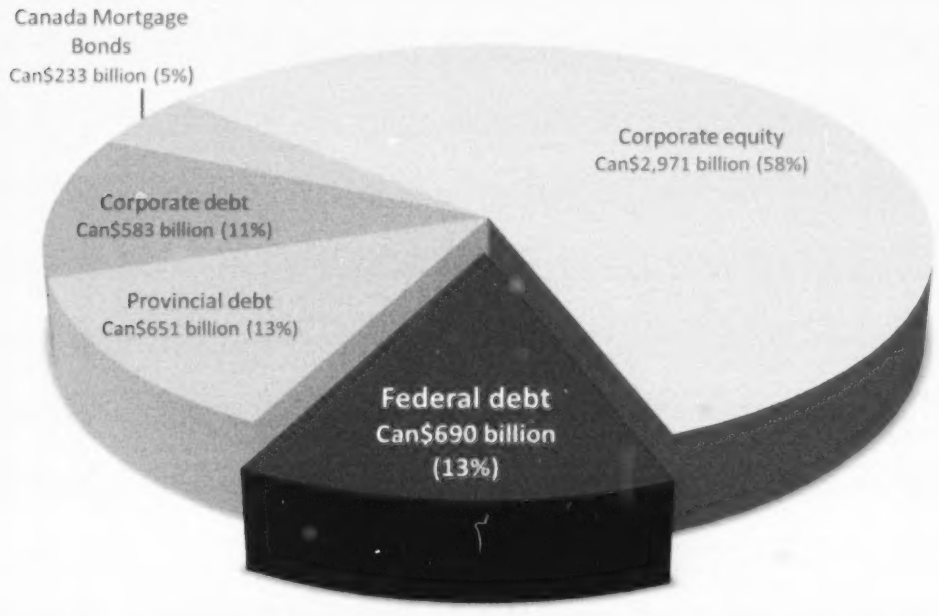
1. Introducing Government of Canada fixed-income securities

The Government of Canada borrows funds by issuing fixed-income securities to investors. These securities, called Government of Canada (GoC) securities, pay interest and are redeemed upon maturity for the value of the loan. Currently, the government issues three types of securities: nominal bonds, treasury bills and Real Return Bonds. As of December 2017, there was $690 billion in GoC securities outstanding, and the daily volume of government securities traded was $8 billion.[2] **Chart 1** shows the size of the GoC securities market relative to other Canadian markets, such as the corporate debt, provincial debt and corporate equity markets.

Chart 1: Size of Canadian capital markets by the largest asset classes, end of 2017[3,4,5]



GoC securities provide the federal government with funding for its spending, investment and cash-management purposes. For investors, GoC securities provide a low-risk investment with a regular source of cash flows, a set of prices to infer a yield curve, and, for certain securities, a money-like store of value and medium of exchange. GoC securities are also high-quality collateral and can therefore be used by investors to secure or to fund other financial transactions. As GoC securities are the most common form of collateral in Canadian securities financing and are used as a benchmark for pricing most fixed-income securities in Canadian dollars, the Bank of Canada deems the market for GoC securities a core funding market (Fontaine, Selody and Wilkins 2009).

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[2] The outstanding amount is adjusted for inflation.

[3] Corporate equity is a TSX-listed group market capitalization, as of the end of 2017.

[4] Maple bonds, municipal bonds and Crown corporation bonds are not included in this chart because of their low outstanding amount (less than 2 per cent).

[5] Federal debt refers to the GoC public debt. This includes outstanding amounts of GoC T-bills and bonds, as of the end of 2017.

Terms and conditions

All GoC securities are debt securities created under the *Ontario Securities Act* (R.S.O. 1990) and are issued by the government under the *Financial Administration Act* (Part IV, sections 44 and 45). The kinds of securities the government issues are distinguished by their terms and conditions, summarized in Table 1.

Table 1: Terms of the GoC securities contract[6]

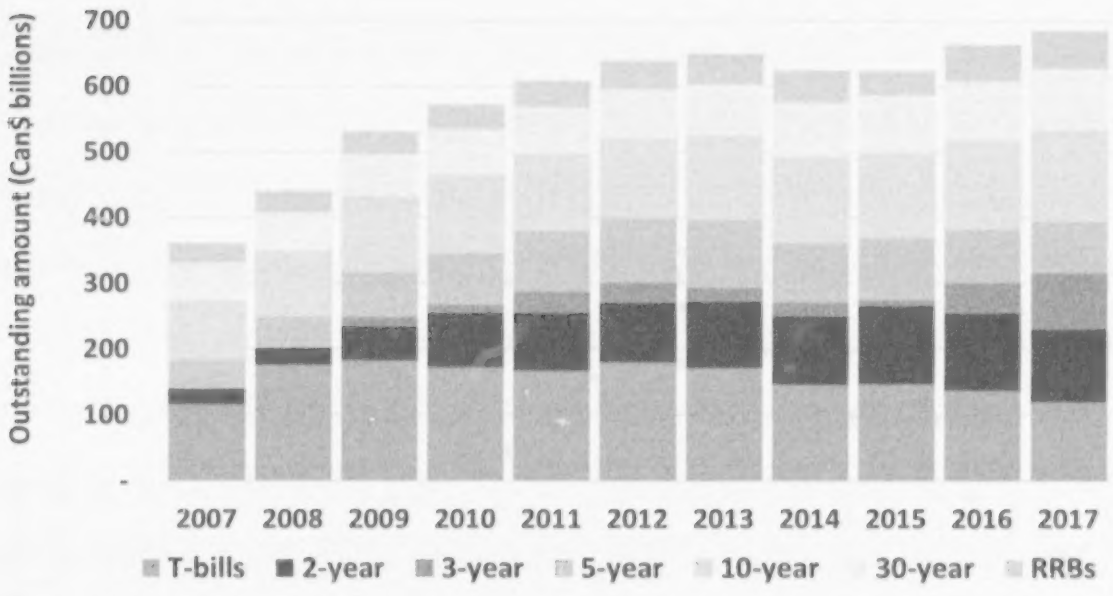
Borrower and issuer	The Government of Canada, which borrows money from investors in exchange for GoC securities.
A direct, unsecured and unconditional obligation	The GoC securities contract obliges the government to make payments on a direct loan (the government is both the issuer and the borrower) that is unsecured (not collateralized) and unconditional (no requirements must be met for payment).
Maturity date	The calendar date on which the government will redeem a security, fulfilling and ending the securities contract.
Par value, face value or principal	The amount of money the government will pay on the maturity date of the security and the amount used to compute the interest payments. For a GoC security, the par value is $1,000.
Registered owner	The Canadian Depository for Securities Inc. (CDS) & Co., as nominee of CDS, is the registered owner of all GoC securities and facilitates the processing of payments. GoC securities exist only as electronic book entries in the records of CDS.
Beneficial owner	The individual or company that holds an interest in the security and so is entitled to receive any coupon payments and the principal amount on the maturity date of the security.
Coupon payment	A periodic interest payment made during the life of a bond. Securities such as T-bills that lack a coupon are called zero-coupon bonds.
Coupon payment dates	The dates when the government makes coupon payments. For GoC bonds with coupons, the coupon is paid on calendar dates semi-annually, and the maturity date of a bond is typically on one of the coupon dates.
Coupon rate	The per annum rate at which interest accrues. For nominal coupon bonds, the size of the payments is half the par value times the rate. For Real Return Bonds, the size of the payment is the par value times the rate times the inflation adjustment.

[6] These securities are unconditional obligations of Her Majesty in right of Canada ("Canada").

Types of securities

GoC securities vary by their term at issuance, coupon and benchmark status. Chart 2 shows the distribution of amounts outstanding for three types of securities named in the legal terms and conditions: nominal bonds (by term at issuance), T-bills, and Real Return Bonds (RRBs).

Chart 2: GoC securities outstanding, by security type at issuance, 2007–17



Source: Bank of Canada

- **Nominal bond**: A GoC security issued with more than a year to its maturity date and that pays fixed-rate coupons semi-annually. The government currently issues nominal bonds with six different terms to maturity: 2-year, 3-year, 5-year, 10-year, 30-year and 50-year (ultra-long), all displayed in green in **Chart 2**.[7]
- **Treasury bills (T-bills)**: There are three categories of T-bills: Regular T-bills, fungible cash-management bills and non-fungible cash-management bills. T-bills have no coupon payments and as such are typically issued at prices below their par value.
  - **Regular T-bills** are issued with three different terms to maturity: 3-month, 6-month, and 1-year.
  - **Cash-management bills** are securities with terms to maturity of between one day and three months. These terms ensure that the government has sufficient cash balances to meet its operating requirements.
    - **Fungible cash-management bills** are cash-management bills that share the same maturity date with previously issued regular treasury bills.
    - **Non-fungible cash-management bills** are cash-management bills with different maturity dates than previously issued regular T-bills.

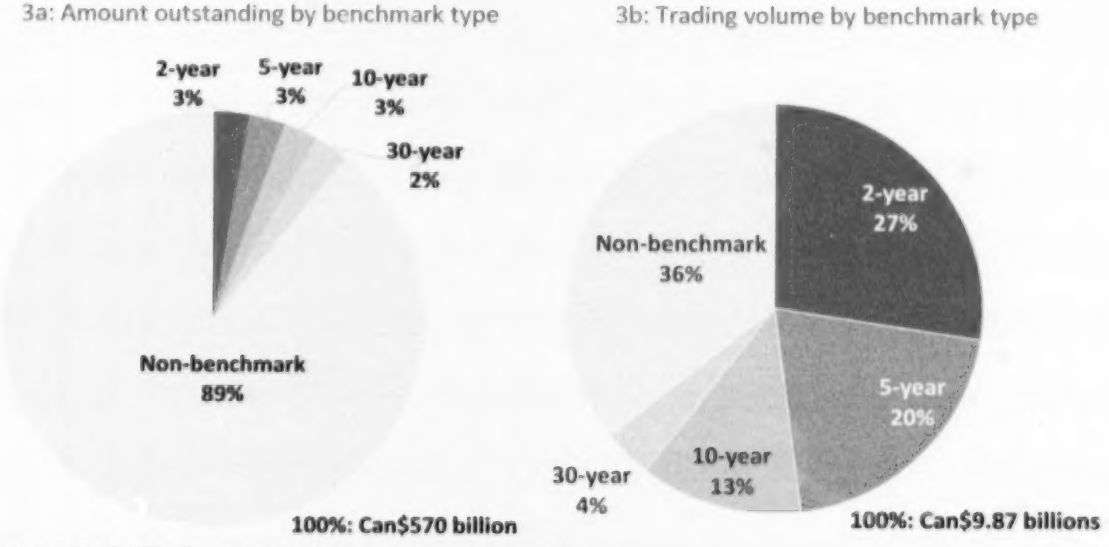
[7] Ultra-long bonds (50-year type) are not displayed in Chart 2 because of their small amount outstanding.

- **Real Return Bonds (RRBs)**: Securities that pay fixed-rate coupons and for which inflation compensation is provided semi-annually. The RRB present value depends on future fluctuations in the inflation rate.[8] The par value at maturity is adjusted for inflation. The government currently issues RRBs solely in the 30-year sector.

Benchmark status

Most GoC nominal bonds receive a temporary status during their life cycle that is called a benchmark.[9] A benchmark bond is a bond for which the price is used as a reference price (or "benchmark") for other Canadian fixed-income securities. For example, many derivatives have payoffs that are tied to the price of a benchmark security, and Canadian provincial bonds are often quoted in terms of a yield spread against a GoC benchmark bond. **Chart 3** shows the amount outstanding and the trading volume of bonds that had benchmark status at the end of 2017, given as percentages of the total amount outstanding and total trading volume.

Chart 3: Amount outstanding and trading volume of GoC bonds, by benchmark type, end of 2017



Sources: Market Trade Reporting System and Bank of Canada

At any time, there are four benchmarks in Canada, distinguished by tenor: the 2-year, 5-year, 10-year and 30-year benchmarks. The benchmark status is conferred by market participants, who decide when GoC bonds become the benchmark and when they lose their benchmark status.

2. The primary market

The primary market is the market in which issuers sell newly created quantities of a security. In the case of the primary market for GoC securities, the Bank of Canada issues securities at an auction, on behalf of

[8] The inflation rate is the rate of change in the consumer price index (CPI) published by Statistics Canada.
[9] Ultra-long and 3-year bonds do not receive benchmark status during their life cycles.

the government, and to a limited market composed of authorized participants. As the government's fiscal agent, the Bank also acts as its consultant by providing strategic policy advice on debt management.[10] Except for ultra-long bonds, GoC securities have been issued using the current auction process since 1998. In 2017, the amounts sold at auction averaged $3.5 billion for nominal bonds, $11.4 billion for regular T-bills and $550 million for Real Return Bonds.

The GoC auction process[11]

Most GoC securities are auctioned at multiple-price auctions, where winning bidders pay their bids for each unit of security. This format is also called a discriminatory-price auction and a pay-as-bid auction. However, for RRBs and ultra-long bonds, the format is a uniform-price auction, in which all winning bidders pay the price of the highest yield of accepted competitive bids. This format is also called a single-price auction.

The dates of GoC auctions are announced well in advance. Before the start of each quarter, the Bank of Canada publishes a quarterly bond schedule containing information about upcoming nominal and Real Return Bond auctions, such as: auction format, allotment method, date of the call for tender, auction date and the amount coming to maturity on the settlement date.[12]

For nominal and Real Return Bonds, auctions occur one to four times a quarter; for regular treasury bills, every two weeks; and for cash-management bills, at ad hoc frequencies. **Table 2** gives the typical frequency and format of auctions by type of GoC security.

Table 2: Auction characteristics by security type

Security type	Auction frequency	Auction format
T-bills	Bi-weekly	Multiple price
2-, 3- and 5-year nominal bonds	1–4 times per quarter	Multiple price
10-year nominal bonds	1–2 times per quarter	Multiple price
Real Return Bonds	Quarterly	Uniform price
30-year nominal bonds	Semi-annually[13]	Multiple price
Ultra-long bonds	Ad hoc	Uniform price[14]

[10] **For more information, see** Developing a Medium-Term Debt-Management Strategy for the Government of Canada.

[11] **For further details, see** Standard Terms for Auctions of Government of Canada Securities.

[12] **See the** Quarterly Bond Schedule.

[13] **In 2017, there were three auctions for 30-year nominal bonds.**

[14] **Since October 2016, further ultra-long bonds have been issued via uniform-price auctions; see** Standard Terms for Auctions of Government of Canada Ultra Long Bonds.

Participation at auction[15]

Two categories of participants are authorized to submit bids at GoC auctions: government securities distributors (GSDs) and the Bank of Canada.[16] A GSD is a private entity that the government and the Bank of Canada permit to submit bids at auctions. Other participants, known as customers, may also bid, but must do so through a GSD. Any participant who bids at auction is subject to a registration process.

Auction participants may submit competitive and non-competitive bids. A competitive bid specifies both a yield and a quantity, whereas a non-competitive bid specifies only a quantity and is guaranteed to be allotted at the average yield of accepted competitive bids at the auction. To avoid a conflict of interest, the Bank of Canada submits only non-competitive bids. In April 2018, non-competitive bids for bond auctions typically represented around 1 to 2 per cent of the auction size, whereas T-bill non-competitive bids represented approximately 0.8 per cent of the auction size.[17]

GSD and customer bidding at auctions is constrained by auction limits, which are based on the participant's own bidding limit and net position in the securities being auctioned. These limits are designed to prevent any one participant from gaining market power over the distribution of a specific security. For an example, see Jordan and Jordan (1996), in which Salomon Brothers gained an effective 86 per cent market share in 2-year U.S. Treasury notes.

An entity must apply to the Bank of Canada to become a GSD, and it must satisfy several requirements:

- The candidate firm must demonstrate a capacity to distribute government securities by providing evidence of its fixed-income trading activity in Canada over the previous six months.
- The firm must support the GoC securities secondary market by market-making, which means that it is standing ready to trade with other bond investors on demand.
- It must agree to report all government securities transactions using the Market Trade Reporting System (MTRS).
- Last, it must agree to submit at least one winning bid every six months.

There are two types of GSDs: primary dealers (PDs) and other GSDs (O-GSDs). PDs have higher bidding limits and tend to be the largest participants in GoC securities auctions. Commensurate with the higher bidding limits, PDs must satisfy additional requirements:

- PD participation at auction for nominal bonds, RRBs and fungible cash-management bills is mandatory via a minimum bidding requirement.[18]
- PDs must maintain a sufficient level of GoC trading activities as a market-maker in the secondary market. We discuss this in section 3.

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[15] For more details, see the Standard Terms for Auctions of Government of Canada Securities.

[16] The Bank of Canada acquires GoC securities at auctions for balance-sheet purposes. For further details, see Statement of Policy Governing the Acquisition and Management of Financial Assets for the Bank of Canada's Balance Sheet.

[17] The share of non-competitive bids for bonds and T-bills does not include the Bank of Canada's non-competitive bids at auction. There are also limits on the size of non-competitive bids.

[18] For more on the bidding limits, see tables 2 and 3 in the Standard Terms for Auctions of Government of Canada Securities.

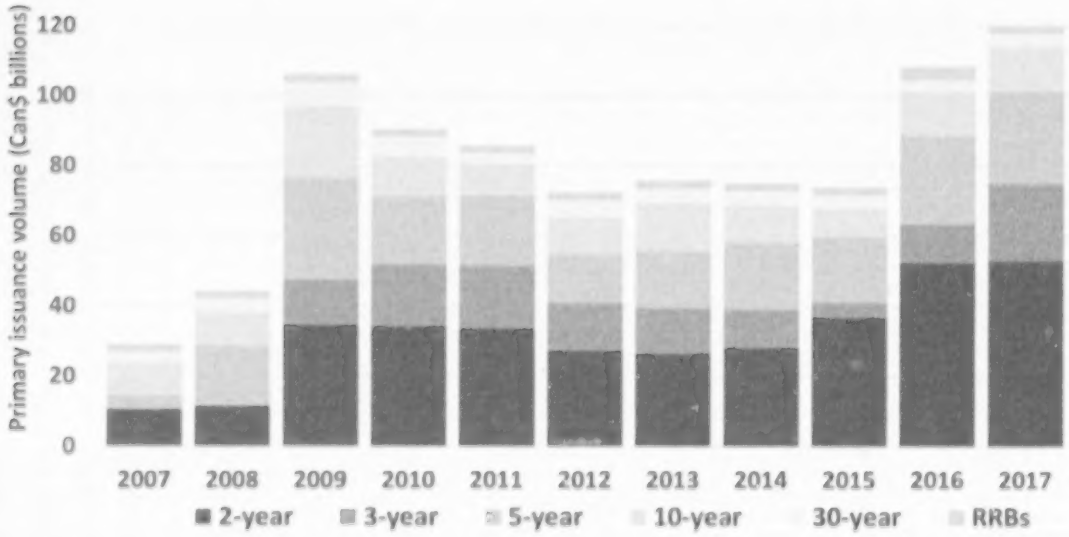
Allotment

About one week before a bond auction or a regular T-bill auction, the Bank releases a call for tender. The call provides specific information about the auction: the auction date, the bidding deadline, the amount to be auctioned, the issue date, the maturity date, the coupon, the current outstanding amount, the ISIN (International Securities Identification Number), the accrued interest and the Bank of Canada minimum purchase for nominal bonds. Although participants may bid at any time after the release of the call for tender until the bidding deadline, in practice, they submit bids on the day of the auction within minutes of the deadline (Hortacsu and Kastl 2012).

Once the deadline has passed, the Bank first allots all non-competitive bids. Then, as most of the GoC securities auctions are multiple-price auctions, the Bank allots the competitive bids from the lowest to the highest yield until the amount available at auction is exhausted.[19] If the quantity of bids at the cut-off yield exceeds the amount remaining to be allotted, the bids are pro-rated by the bid size: the remaining quantity is allotted to bidders with bids at the cut-off yield in the proportion of each bid to the total bid at the cut-off. Once the allotment is finalized, the Bank publishes the auction results on its website, often within minutes of the auction closing. The results include information such as the average, lowest and highest accepted yields, and the amount to be purchased by the Bank of Canada.[20]

Chart 4 and **Chart 5** show the annual volumes of government securities issued in the primary market. These issuance volumes are net of the Bank of Canada's purchase amount.

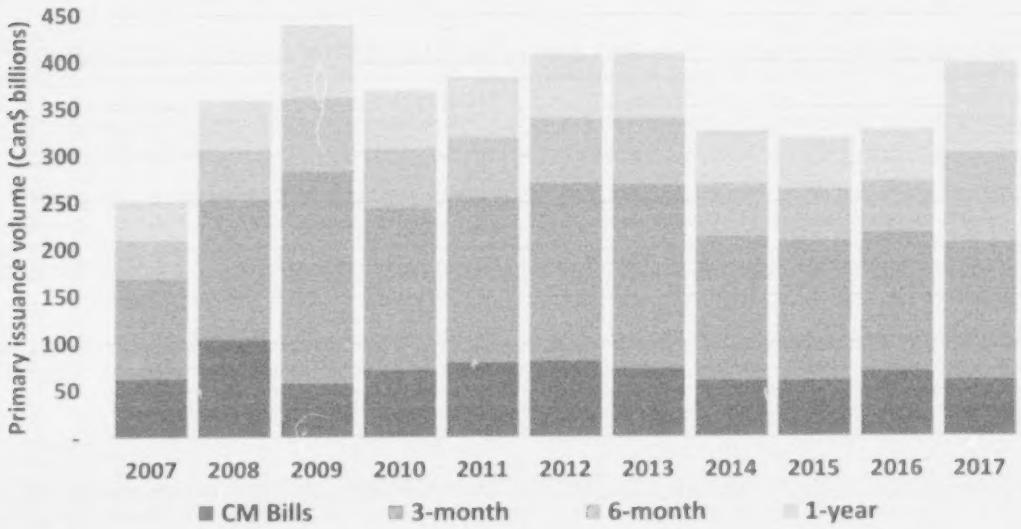
Chart 4: Annual gross issuance of nominal bonds and RRBs at the end of each year, 2007–17[21]



Source: Bank of Canada

[19] For more on auctions, including how the format of an auction influences the outcome, see Klemperer (1999).
[20] For further details on the results published after an auction, see Call for Tenders and Results.
[21] The annual gross issuance amount does not include ultra-long bonds because of their small issuance volume.

Chart 5: Annual gross issuance of T-bills and cash-management bills at the end of each year, 2007–17



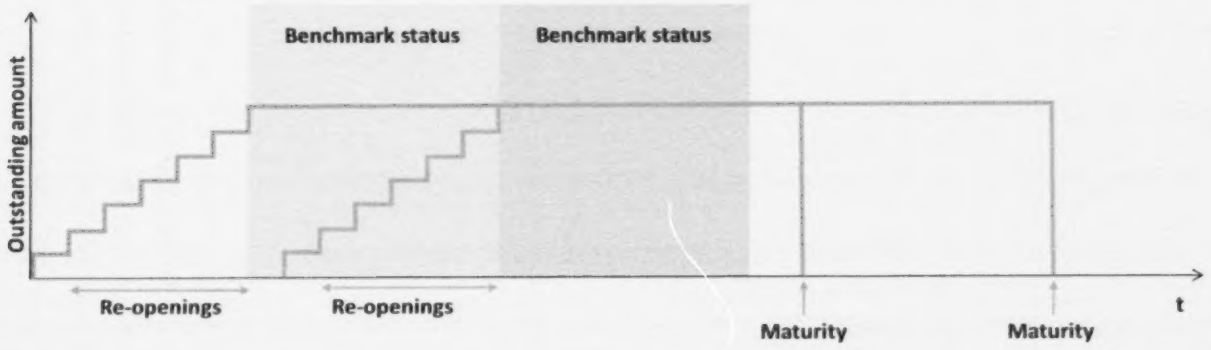
Source: Bank of Canada

Both charts show a significant increase in the issuance volume in 2009 following the GoC response to the global financial crisis. Short-term securities are the most-issued types, given their lower cost of borrowing, their usefulness in cash management and their multiple maturity dates per year. Indeed, their annual issuance volume is much larger than that of long-term securities.

Building a benchmark

In many jurisdictions, a bond receives benchmark status soon or immediately after it is first issued. In Canada, the market waits to confer benchmark status until a bond is re-opened multiple times, resulting in a sufficiently high outstanding amount. The amount outstanding that is necessary to achieve benchmark status is known as the benchmark range and is stated in the Government of Canada's annual Debt Management Strategy. As illustrated in **Figure 1**, a new issue typically becomes a benchmark near the end of its series of re-openings. After the new issue achieves benchmark status, subsequent auctions switch to issuing a new security. The new security is similarly re-opened until it replaces the previous benchmark.

Figure 1: An illustrative example of the building of two benchmark bonds



When a bond becomes a benchmark, it is considered "on-the-run" in Canada. Before becoming a benchmark, the bond is called a "building benchmark" during the period when the bond is re-opened multiple times. When a bond leaves its benchmark status, it is "off-the-run" until it reaches maturity. **Figure 2** shows an example of the building of the 10-year bond in 2014 and 2015. This contrasts with the US market, where bonds become benchmarks immediately after issue, as there are often no re-openings. There is less need to wait in US markets, which are deeper and have larger issuance sizes.

Figure 2: Building a 10-year GoC bond: The case of the 2.25% coupon, maturing on June 1, 2025

Initial issuance	Re-opening	Re-opening	Re-opening	Re-opening	New issuance
$2.7B	$2.7B	$2.6B	$2.6B	$2.6B	...
June 2014	July 2014	Oct. 2014	Jan. 2015	April 2015	June 2015

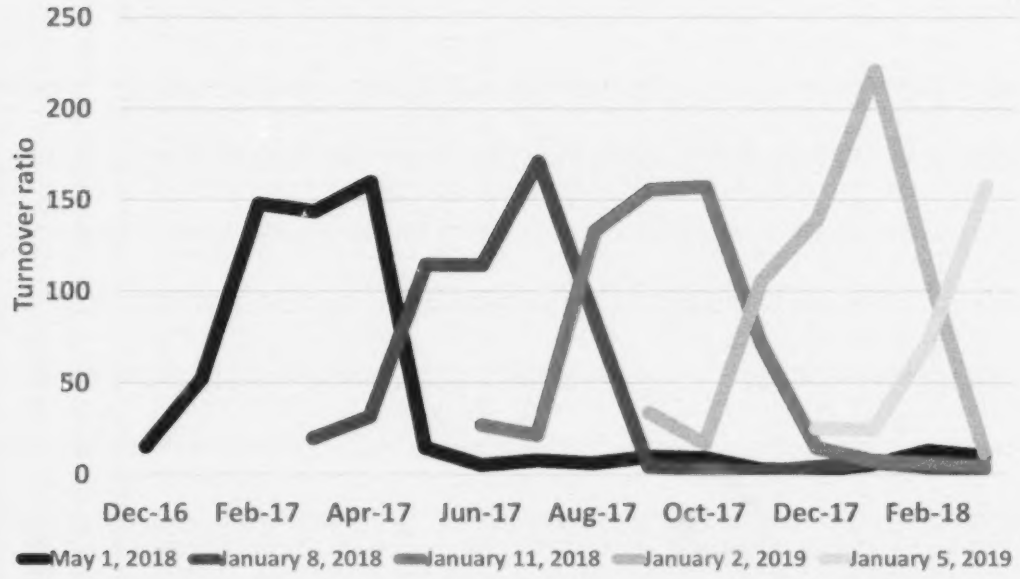
Benchmark status conferred
January 26, 2015–April 20, 2016

Benchmark status stimulates a bond's liquidity, increases its traded volume and causes its price to exhibit a higher liquidity premium than bonds that have almost the same characteristics. These benefits derive from the choice of participants to coordinate on the benchmark to transfer interest rate risks that have terms near the term of the benchmark (Vayanos and Weill 2009).[22]

Chart 6 shows the annualized turnover ratios for four successive 2-year GoC bonds (with different maturity dates). The turnover ratio is computed from the trading volume divided by the outstanding amount. It shows how much the security is traded in term of its amount outstanding. A high ratio indicates that the security is liquid. This chart shows that 2-year bond liquidity rises during its "building benchmark" period until it becomes a benchmark ("on-the-run"). The decline in the turnover ratio occurs when the bond nears the end of its benchmark period and begins its "off-the-run" period.

[22] For further details about interest rate risk, see section 7.

Chart 6: Turnover ratios of successive 2-year bonds



Sources: Market Trade Reporting System and Bank of Canada calculations

3. Participation in the government securities market

Participants invest in GoC debt because it is a low-risk, liquid deposit of funds that earns interest and can also be used for securities financing. GoC bonds are held by a concentrated group of participants, particularly banks and large pension funds. Recently, foreign public investors such as sovereign wealth funds and foreign central banks have sought increasing amounts of GoC securities.

Participants fall into two categories: buy-side and sell-side. Buy-side participants typically buy securities for investment purposes. In contrast, sell-side participants buy securities for resale, providing other participants with the opportunity to own GoC bonds. The sell-side does so by acting as a standing counterparty to those looking to buy or sell a security, a service called dealing or market-making. Sell-side participants are called the "sell-side" because they hold securities primarily to distribute to others.

The buy-side

The main buy-side participants are pension funds, insurance companies, mutual funds, treasuries, hedge funds, exchange-traded funds, sovereign funds and foreign reserve funds.

Pension funds

A pension fund is a long-term saving vehicle to which members, typically employees, regularly contribute funds until retirement. The retiree then receives benefits from the contributions and earnings generated by the pension fund. In the GoC market, pension funds hold a variety of GoC securities and often hold off-the-run GoC bonds with long maturities because their exposures (namely, payment obligations upon retirement) are also long term. Examples of large Canadian pension funds include the Ontario Teachers' Pension Plan, the Healthcare of Ontario Pension Plan and la Caisse de

dépôt et de placement du Québec.[23] As shown in **Chart 8**, pension funds are the largest GoC bondholders in Canada.

Insurance companies

An insurance company is a financial institution that provides compensation in the event of uncertain losses realized by a pool of clients. Some insurance companies may also perform asset management to increase their earnings. Insurance companies make investments because they carry a "float" of capital, which is a quantity of money arising from the time difference between when premiums are collected and when claims are paid out. Since insurance companies may have to pay reimbursements suddenly, they tend to invest in securities that are unlikely to lose value, such as GoC securities, as well as in high-quality corporate debt. Insurance companies with longer-term exposures, such as life and home insurance companies, prefer GoC securities with longer-term maturities. Some large Canadian insurance companies are Manulife Financial, Power Financial, Sun Life Financial, Fairfax Financial and Industrial Alliance Insurance.

Mutual funds

A mutual fund is an investment vehicle for which a manager pools money from individuals and corporations to invest in various asset classes, such as fixed-income securities. Mutual funds have a long-term investment horizon and, depending on their mandate, some may prefer securities with greater yields than GoC debt. Funds still invest in government debt because they must maintain at least some assets that will retain value to cover unexpected or unusually large redemptions from investors.[24] Mutual funds are an important avenue for retail investors to participate in the GoC securities market. Some large Canadian mutual funds are the RBC Bond Fund; the Fidelity Canadian Bond Fund; and the Phillips, Hager & North Bond Fund.

Banks' treasuries

A treasury department at a commercial bank ensures that the bank has sufficient capital to fund its business activities, such as providing credit and paying its debt obligations. A treasury department has money to invest because, owing to the day-to-day flow of funds, a private bank may find it has excess cash that is not being used for short-term obligations. Because treasuries' financial obligations are mostly short term, when they invest in GoC debt they are often active on 2-year and 5-year bonds and T-bills. As shown **in Chart 10**, banks are the largest holders of T-bills.

Hedge funds

A hedge fund is a pooled investment fund that has a higher tolerance for risk than typical market participants. Since hedge funds aim to generate high returns, they look for profitable trading opportunities in the GoC securities market.

Exchange-traded funds

An exchange traded-fund (ETF) is a pooled investment fund that trades on public exchanges such as the Toronto Stock Exchange. Most Canadian fixed-income ETFs aim to track the performance of a bond index (rather than trying to outperform an index). Some ETFs fully replicate the index they track: the ETF

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[23] **For further details, see** Large Canadian Public Pension Funds: A Financial System Perspective.

[24] **For further details, see** Canadian Open-End Mutual Funds: An Assessment of Potential Vulnerabilities.

holds each individual security that is part of the index. Since the costs of full replication can be high, other ETFs build a bond portfolio with similar risk characteristics as the index they track by using a smaller sample of securities. Several Canadian fixed-income ETFs track indexes focused on GoC securities, including the BMO Short Federal Bond ETF (ZFS), iShares 1–5-year Laddered Government Bond Index ETF (CLF), and iShares Canadian Government Bond Index ETF (XGB).[25]

Foreign reserves and sovereign wealth funds

Foreign reserves and sovereign funds are the main non-resident participants in the GoC securities market. A foreign reserve is a managed pool of securities denominated in various currencies that is managed by a central bank and that could be used for an intervention in markets. In Canada, international reserves belong to the federal government, for which, as fiscal agent, the Bank of Canada executes investment and funding transactions. Foreign central banks prefer to invest reserves in securities that retain value, such as government debt, and in liquid securities, such as benchmark bonds, in case a foreign-market intervention is required.

A sovereign wealth fund is a managed pool of securities used for national investments and savings. Since the 2008–09 financial crisis, sovereign wealth funds cited diversification and portfolio resilience against shocks as the main factors in their increasing demand for GoC securities.[26] **Chart 7** and **Chart 9** show the increasing holdings of GoC securities by non-residents following the financial crisis.

The sell-side

Any participants willing to buy (or sell) a security must reach out to a market-maker to act as a counterparty by selling (or buying) this security. For its market-making activities, a sell-side institution may hold sufficient securities in its inventory to immediately provide quantities to participants. There are two types of market-making activities: agency trading and principal trading. In agency trading, primary dealers match buyer and seller trades without using securities in their inventory. In principal trading, primary dealers use their own inventory to trade securities. Additionally, the buy-side may also provide liquidity to dealers by responding to dealers who are looking to buy or sell bonds.[27]

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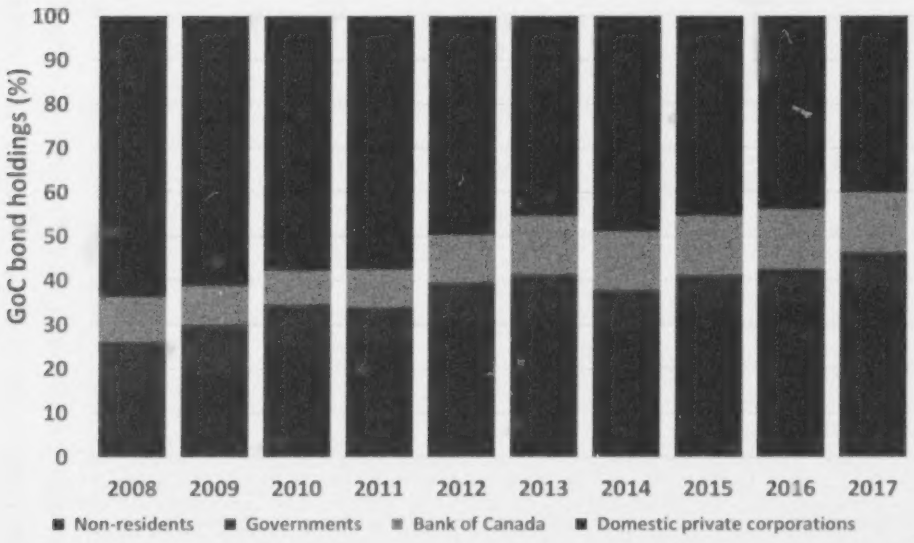
[25] **For more on ETFs, see** Understanding Exchange-Traded Funds: How ETFs Work.

[26] **For further details, see** The Canadian Dollar as a Reserve Currency.

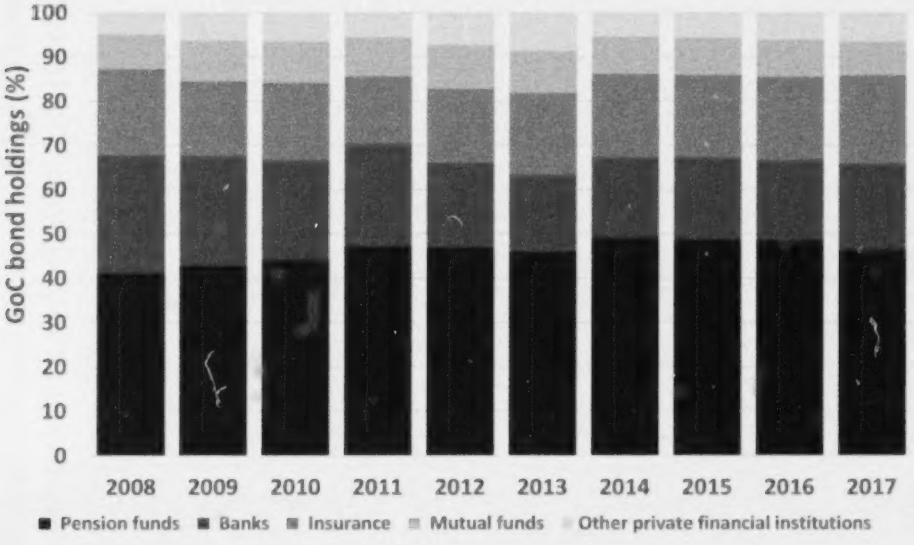
[27] **For more information about customer liquidity provision in Canadian bond markets, see** Garriott and Johal (2018).

Chart 7: Holders of GoC bonds, by type, 2008–17[28,29]



Sources: Statistics Canada and Bank of Canada

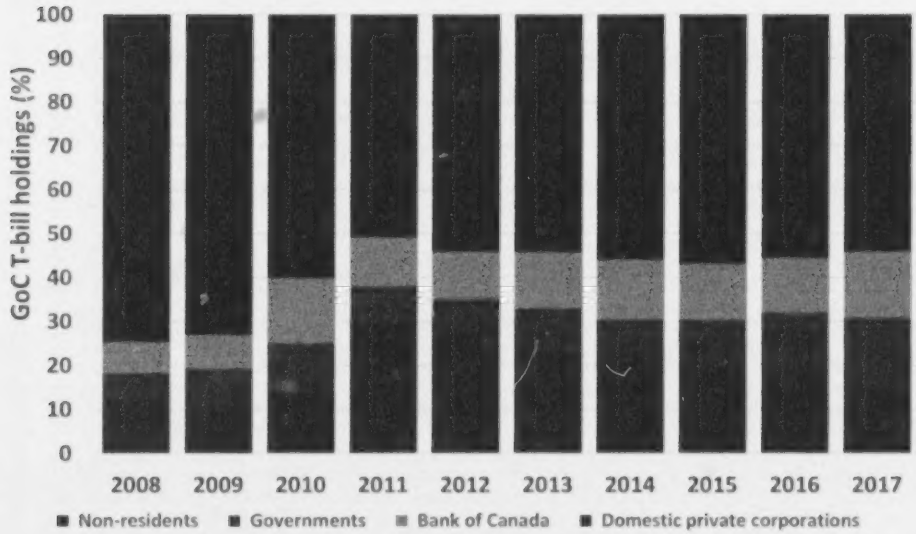
Chart 8: Domestic private holders of GoC bonds, by type, 2008–17[30]



Source: Statistics Canada

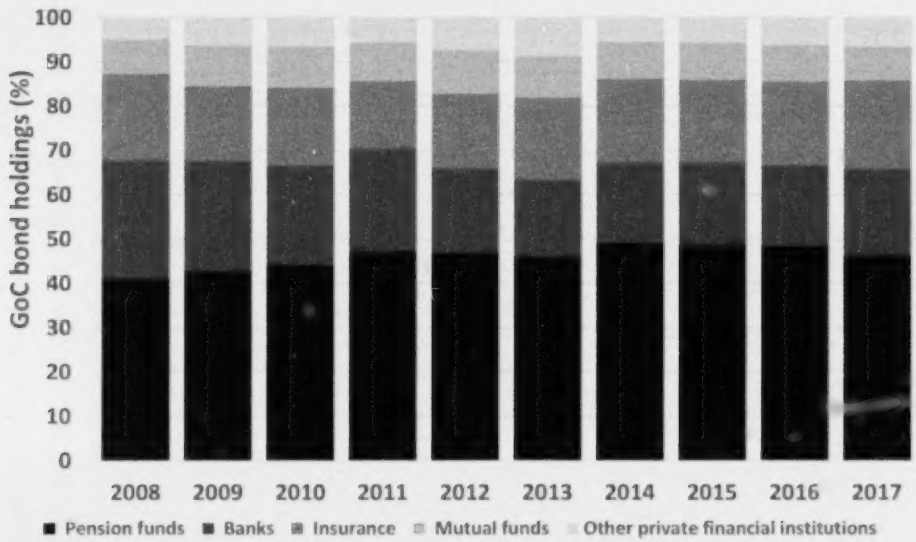
[28] Household holdings are not included in the chart because of their small volumes.
[29] Government holdings also include social security funds and financial and non-financial business enterprises.
[30] The non-financial section is removed from GoC bond holdings because of its small volumes, which account for less than 2 per cent of the breakdown of domestic private corporations.

Chart 9: Holders of GoC T-bills by type, 2008–17



Sources: Statistics Canada and Bank of Canada

Chart 10: Domestic private sector holders of GoC T-bills, by type, 2008–17



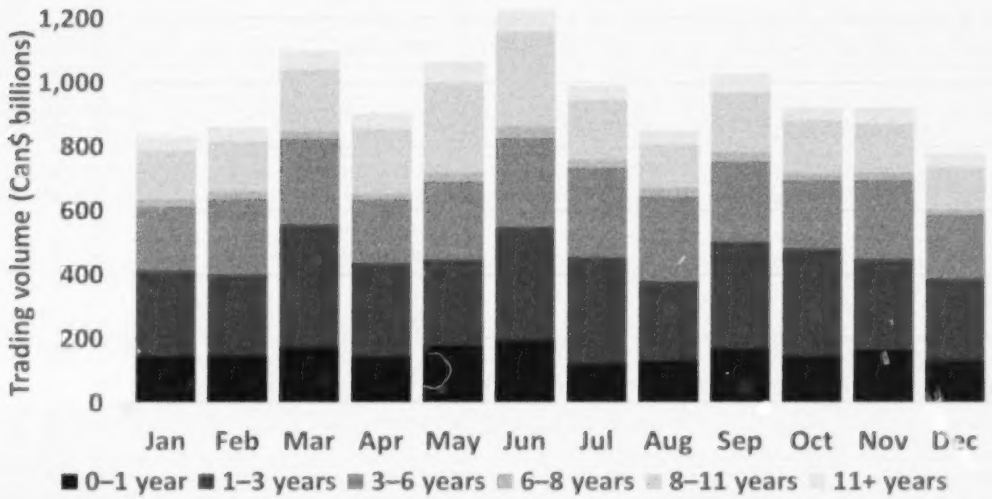
Source: Statistics Canada

4. The secondary market

A secondary financial market is where existing quantities of a security are traded. Market participants may wish to trade GoC securities because they need to adjust their exposure to Canadian interest rates or to government credit. In 2017, GoC securities with a trading volume of $11 trillion changed hands, a

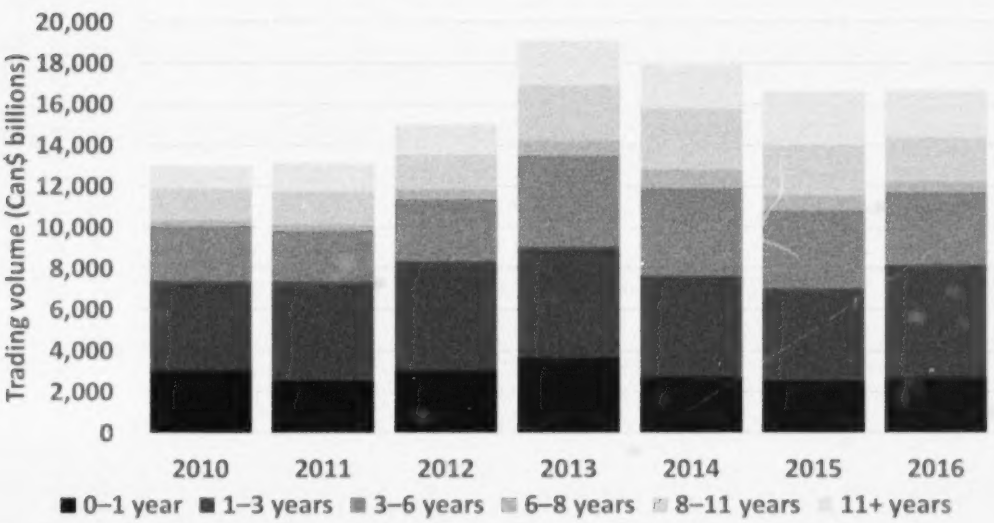
turnover of 16.6 times the amount outstanding. **Chart 11** shows the monthly trading volume of GoC securities by term to maturity. **Chart 12** shows the annual trading volume of GoC securities by term to maturity between 2010 and 2016. For example, a security with a term to maturity of exactly one year enters the 0–1-year category, whereas a term to maturity higher than one year enters the 1–3-year category.

Chart 11: Monthly trading volume of GoC securities by term to maturity, 2017



Source: Market Trade Reporting System

Chart 12: Annual trading volume of GoC securities by term to maturity, 2010–16

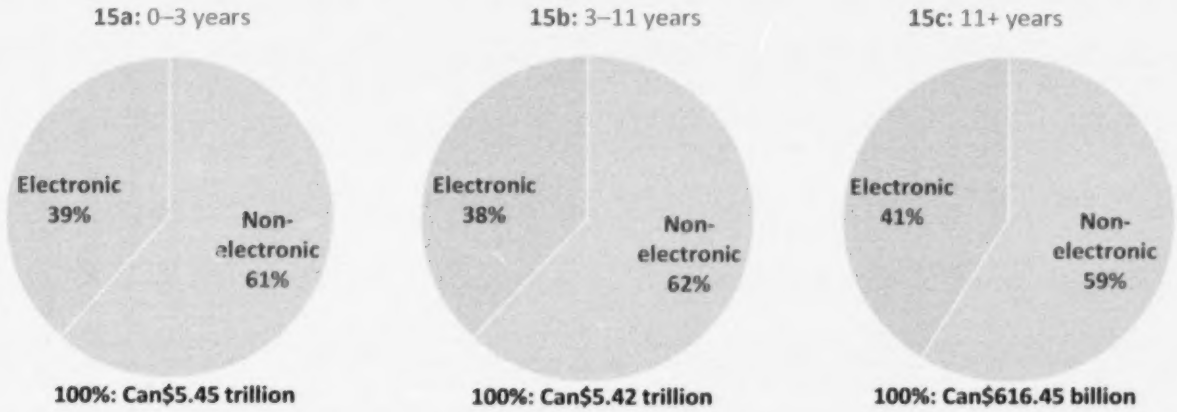


Source: The Canadian Depository for Securities

Trading venues

Although secondary trading in stock markets has long been centralized on electronic exchanges, the secondary market for GoC debt is still mostly bilateral and is often conducted over the phone. Although the GoC bond market is becoming increasingly centralized and electronic, there is still no large-scale centralization of trade on trading platforms across the spectrum of market participants. Still, participants often use technology to expedite their existing trading practice, for example by negotiating trades bilaterally through messaging systems such as Bloomberg instead of by telephone. **Chart 13** shows the relative shares of electronic vs. non-electronic trading according to the "electronic trade" flag from Canada's Market Trade Reporting System (MTRS).

Chart 13: Relative shares of electronic vs. non-electronic trading activity of GoC securities, by term to maturity, end of 2017[31]



Source: Market Trade Reporting System

The Canadian venues are distinguished by the market segment that they serve

- dealer-to-dealer segment: trades exclusively between securities dealers (and not between the customers of securities dealers);
- dealer-to-client segment: trades between securities dealers and other financial institutions, namely, the dealers' customers (and not trade between dealers or trade between non-dealers);
- all-to-all segment: trades between any two financial institutions.

The interdealer brokers (IDBs) serving the dealer-to-dealer segment in Canada are Shorcan Brokers, Freedom Brokers and Tullet Prebon Canada. These institutions specialize in helping sell-side institutions, such as dealers, find counterparties to trade. IDBs trade on an agency basis: they match a buyer to a seller but do not take the security that is traded onto their own balance sheet. Financial institutions that are not dealers (i.e., the clients of dealers) are not eligible to join the networks served by IDBs.

The traditional business of an IDB is to take an order for GoC securities from one dealer and work it by calling other dealers to negotiate a price and quantity. More recently, on platforms such as Bloomberg,

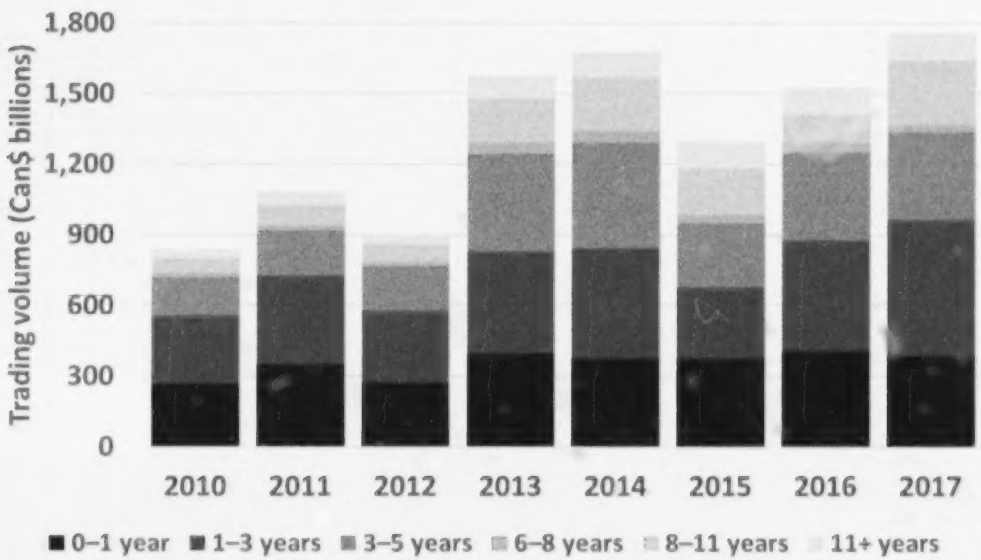
[31] For example, a security with a term to maturity of exactly three years enters the 0–3-year category, whereas a term to maturity higher than three years enters the 3–11-year category.

IDBs advertise prices on-screen in the form of a buy price (or bid) and a sell price (or ask) taken from dealer orders anonymously. Securities dealers can trade with one another at these prices and can quote new prices electronically, although it is more common to do so through a chat on Bloomberg. Relatively little volume is immediately available on-screen. On IDB screens in Canada, a traded security is indicated by a flashing price. If a dealer wants to join the transaction by trading larger volumes of GoC securities, this is also indicated by a flashing price; this practice, known formally as the workup process, is studied in Duffie and Zhu (2016).

There are two trading platforms in Canada serving the dealer-to-client segment: CanDeal and Bloomberg Fixed-Income Trading (FIT). CanDeal is owned by the Canadian securities dealers and the TMX Group, whereas Bloomberg FIT is owned by Bloomberg Professional Services. On both platforms, clients may query dealers for prices by launching a temporary electronic auction called a request for quote (RFQ). To launch an RFQ, the client submits a desired quantity to a set of dealers, who may respond with quoted prices. The client may then click to trade with a dealer or may cancel the request for quotes. **Chart 14** shows the annual trading volume of GoC securities by term to maturity traded on CanDeal from 2010 to 2017.

Finally, the single institution in Canada serving the all-to-all segment is CBID, a trading platform owned by Perimeter Financial. CBID maintains an electronic limit-order book on which any participant may quote a price to buy or sell a GoC security and may agree to trade with another participant at its quoted price. CBID's share of the GoC securities trade is small compared with that of other platforms.

Chart 14: Annual dealer-to-client trading volume of GoC securities traded on CanDeal, by term to maturity, 2010–17[32]



Source : CanDeal

[32] A security with a term to maturity of exactly one year enters the 0–1-year category, whereas a term to maturity higher than one year enters the 1–3-year category.

Bank of Canada operations

The Bank of Canada, on behalf of the Minister of Finance, trades in the secondary market to pursue liquidity and cash-management objectives. Its operations are organized under two programs: the Regular Bond Buyback Program and the Cash Management Bond Buyback Program. While the two programs have different objectives, both involve the Bank repurchasing, through reverse auctions, select off-the-run GoC bonds from participants, in exchange for either benchmark bonds or cash, depending on the type of operation.

As in primary market auctions, when the Bank conducts a buyback operation, participants submit a set of bids to the Bank. In contrast to primary market auctions, the Bank is not a participant in its own auctions, and the participation of primary dealers is voluntary.

The Cash Management Bond Buyback (CMBB) Program[33]

The objective of this program is to smooth the schedule of the government's cash payments related to coupons and maturity payments. This helps to stabilize the issuance of T-bills over the year.

The cash-management bond buyback operations usually occur weekly, on Tuesday mornings. Through a call for tender, the Bank of Canada announces the list of bonds eligible for repurchase and the maximum repurchase amount. For a bond to be eligible, it must have a term to maturity of less than 18 months, and there must be an outstanding amount higher than $8 billion on the date when it matures.

Regular Bond Buyback Program

The objective of this program is to enhance market liquidity and promote new benchmark issues in the primary market for Government of Canada securities.[34] The program offers two types of operations, bond buyback on a switch basis and bond buyback on cash basis. A bond buyback on a switch basis occurs when the government repurchases selected off-the-run bonds from participants in exchange for benchmark bonds. A bond buyback operation on a cash basis is similar, but the government exchanges selected off-the-run bonds for money.

Upcoming operations are announced via the quarterly bond schedule, which shares information about the sector of the operation, the reverse auction date, the call-for-tender date and the delivery date. The call-for-tender date occurs one week before the reverse auction and communicates the maximum amount to be repurchased (or issued for switch operations), the list of eligible securities and the replacement securities (for switches).

Since 2012, the Bank has conducted buybacks only on a switch basis and only in the 30-year sector. At the time of writing, the last bond buyback on a cash basis was in 2012, targeting the 10-year sector.

5. GoC securities: Trading practices

In this section, we describe common terms and practices used when trading GoC securities. We define the common trading strategies involving GoC securities in the cash market. Participants trade GoC securities both for hedging purposes and for earning profit. Most trading activities are performed through a bond desk, which serves a client or permits other financial institutions to run their operations.

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[33] For more information, see Debt Management Report 2015–2016.

[34] For more information on these operations, see Details on Bond Buyback Operations.

Terminology

Discounts and premiums on fixed-income securities

The price of a fixed-income security is often expressed as a percentage of its par value ($1,000). This is called the quote. The location of the quote relative to 100 per cent determines whether the bond is traded at discount, at premium or at par (**Table 3**).

Table 3: Sample quotes and market prices of a security with a $1,000 par value

Quote (%)	Market price ($)	Security is traded at
95	$950	Discount
105	$1,050	Premium
100	$1,000	Par

Price-yield relationship

The market value of a GoC security can be expressed as a price or as a yield. The price expresses the market's present valuation of the expected cash flows of the security (coupon payments and par value). Many factors can influence the price of a fixed-income security: the size, frequency, and dates of arrival of the coupon payments; the size of the principal payment and the maturity of the contract; prevailing interest rates and the availability of substitutes; the scarcity of the security; etc.

The yield, in contrast, expresses the annualized expected return of the security if the investor were to hold it to maturity, assuming no default. It is convenient to express the value of a security in terms of its yield so that its returns can be compared with the returns of other investments. Price and yield have an inverse relationship. Assuming no default occurs, if a bond is selling at a discount, it means the same cash flows are now available at a cheaper price, and thus the investment will bring greater returns.

Price sensitivity to the interest rate

There is an inverse relationship between the risk-free interest rate and the market price of a GoC security. When the interest rate rises, it increases the opportunity cost of holding existing securities, so the price of existing securities falls. Since prices and yields also have an inverse relationship, an increase in the interest rate also raises the yield.

Two important measures express the price sensitivity of a security to interest rate variations: duration and convexity. Duration is the percentage variation of the security's price following an interest rate variation of 1 per cent.[35] Because of compounding, long-term securities have a higher duration than short-term securities: the price of a 30-year bond will increase significantly more than the price of a 2-year bond following a decrease in the interest rate. Convexity is the percentage variation of a security's *duration* due to an interest rate variation of 1 per cent.

Common trading strategies in the GoC securities market

Investors trade GoC securities strategically to achieve a desired outcome. In this section, we present common strategies for trading categorized by the intended effect: hedging strategies and principal

[35] There are many formulations of duration, such as modified duration, Macaulay duration and dollar duration. For more information, see Fabozzi (2007).

trading strategies. The goal of hedging strategies is to control the firm's risk profile, whereas the goal of principal trading strategies is to earn a profit.

Any trading strategy is deployed by buying and selling securities, and, as they trade, participants enter long and short positions. A long position is a state of the balance sheet in which the trading participant is the beneficial owner of some quantity of GoC securities. A short position is a state of the balance sheet in which the trading participant has sold some quantity of securities and then has borrowed these. In a short position, a participant must eventually procure the security that it borrowed, often by repurchasing it and returning it to the lender.[36]

Hedging strategies

Participants may trade GoC securities to limit or manage risks that arise from other financial positions taken by the firm. **Table 4** describes some examples of the main trading strategies for hedging. Many strategies intend to hedge against interest rate risk; see section 7 for a description of this risk.

Table 4: Examples of common trading strategies for hedging purposes

Long and short positioning	A participant may have a long (or short) position with GoC securities to protect its firm before a change in the Bank of Canada's policy rate.
Short hedge	A short hedge using government bonds is a short position that protects a participant against interest rate risk in an investment. For example, a participant with an investment in corporate bonds may sell short a government bond of similar duration, which offsets the interest rate risk portion of the investment (and partially funds the investment).
Duration matching	Duration matching is buying a portfolio of securities with a duration that matches the duration of a firm's liabilities. This can offset the sensitivity of a firm's funding to changes in the interest rate.
Cash-flow matching	Cash-flow matching is buying a portfolio of securities with payment dates that match the cash outflows of a firm's liabilities. This strategy is often used by firms with a long-term investment horizon, such as pension funds and life insurance companies, who need to ensure that payment flows arrive when needed. Coupon payments for 30-year GoC bonds or RRBs can be held by these firms to match expected future cash outflows. This strategy aims to hedge against funding risk by reducing the mismatch between the firm's inflows and outflows.
Stripping	Participants may "strip" bonds by separating the par value and the coupon payments. Since stripped bonds lack coupon payments, they provide a better hedge against reinvestment risk at a long-term horizon, and there is no need to reinvest coupon payments. Stripping bonds may also be useful for participants who want to match the future cash flows of their liabilities.
Holdings for regulatory purposes	Many regulations require a firm to engage in additional hedging as it conducts its operations. For example, banks may purchase GoC securities as needed to fulfill requirements to hold high-quality liquid assets (HQLA) that could be sold to meet unexpected liabilities. The quantity of HQLA to be held depends on the bank's liabilities risk profile (as per Basel III, for example).[37]

[36] Participants often borrow securities via repo; see Garriott and Gray (2016) on the Canadian repo market.
[37] For further information about Basel III regulation, see Basel III: Finalising post-crisis reforms.

Principal trading strategies

Participants may also trade GoC securities to earn profit. **Table 5** describes some examples of the main strategies.

Table 5: Examples of common principal trading strategies

Buy and hold	This consists of buying a security and holding it for a long period, even until maturity. The participant earns the coupon and maturity payments from the date of purchase through the holding period of the security.
Indexing	An indexing strategy consists of replicating an index to try to beat or match its performance by using a smaller sample of the securities that are a part of the index. Participants can buy GoC securities to replicate an index that has a desirable return.
Yield curve trades	A yield curve trade is a speculation on a future change in the shape of the yield curve. A participant who expects a change may take a long position on a GoC security whose yield is expected to fall or a short position on a GoC security whose yield is expected to increase.
Relative value trades	This type of trade occurs when a participant believes a bond is mispriced relative to a similar security. The participant tries to take advantage of this mispricing by taking a long position in a security that is "cheap," a short position in a security that is "rich" or both in combination.
Market-making	As mentioned in section 3, market-making is standing ready as a counterparty willing to buy or sell securities. Market-makers can trade on two bases: agency or principal. Agency trading is the matching of buyers' and sellers' trades without taking securities in inventory. Principal trading is the use of the market-maker inventory to facilitate others' buying and selling.

6. Infrastructure of the GoC securities market

In Canada, certain financial infrastructures specialize in fundamental market operations, such as transferring bond ownership and processing bond coupon and maturity payments. Primary and secondary market operations would be impossible without these infrastructures. The CDSX, LVTS and CDCS are three domestic financial market infrastructures (FMIs) essential to the GoC securities market. Since these FMIs have the potential to pose systemic risk to the Canadian financial system, the Bank of Canada, under the *Payment Clearing and Settlement Act*, has designated the CDSX, LVTS and CDCS as systemically important and subject to Bank of Canada oversight to ensure that risks are adequately managed by the FMI operators.

1. CDSX is operated by CDS Clearing and Depository Services Inc. (CDS), the national clearing and settlement system for equity and fixed-income securities.
2. The Large Value Transfer System (LVTS) is a systemically important payment system operated by Payments Canada that allows financial institutions to send large payments that are final and irrevocable in real time.
3. The Canadian Derivatives Clearing System (CDCS), operated by the Canadian Derivatives Clearing Corporation (CDCC), is a wholly-owned subsidiary of the Montréal Exchange (MX). CDCS is a central counterparty for many financial instruments—including GoC securities—between CDCC clearing members.

CDSX: Clearing and settlement

CDS Clearing and Depository Services Inc., a subsidiary of the Canadian Depository for Securities Limited, operates CDSX, the infrastructure for the clearing and settlement of GoC securities.

All GoC securities transactions settle via CDSX. In a GoC securities transaction, two parties agree to exchange a GoC security for cash. The settlement is conducted through a central system that ensures consistent post-trade processing (clearing) and simultaneous transfer of securities and funds between parties (settlement). CDSX offers many settlement processes that use collateralization to allow for batched and netted settlement. For more information on CDSX, see McVanel (2003).

Securities depository

In addition to operating CDSX, CDS also provides services as the national securities depository. A securities depository provides safekeeping of securities so that ownership in a security can be transferred via book entries on a ledger. Electronic possession and transfer is efficient, and GoC securities now exist in purely electronic form as book entries at CDS. Bondholders maintain interest in the bonds through accounts at CDS.

As the depository, CDS provides several services: it assigns to each GoC security two unique codes that identify it, called an ISIN (International Securities Identification Number) and CUSIP (Committee on Uniform Security Identification Procedures); it collects the coupon and maturity payments from the government and distributes them to bondholders in the correct proportion; and, at customer request, it can strip or combine individual payments from various GoC bonds to constitute new securities or reconstitute old ones.

The Large Value Transfer System (LVTS)

The LVTS is a systemically important electronic funds transfer system that is owned and operated by Payments Canada. Among its various functions, it facilitates end-of-day settlement of CDSX. Net payment obligations resulting from CDSX settlement, including those for GoC securities, are settled end-of-day during CDSX payment exchange via LVTS transfer to CDS' account at the Bank of Canada. For more information about the LVTS, see Arjani and McVanel (2006).

The Canadian Derivatives Clearing Service (CDCS)

The Canadian Derivatives Clearing Corporation operates CDCS, a central counterparty (CCP) service that clears, for example, cash trades of GoC securities, between CDCC clearing members.[38]

A CCP is an FMI that manages counterparty credit risk. Among its various functions, the CCP interposes itself between buyers and sellers to financial transactions by becoming the buyer to every seller and the seller to every buyer. This process, known as "novation,"[39] results in enhanced netting efficiencies and reduced potential for systemic risk.[40]

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[38] See CDCC Clearing Members List.

[39] Novation involves replacing the original trade contract between the trade counterparties with two new transactions, a buy and a sell, for the same quantity and value between the CCP and each counterparty.

[40] For further information on CCPs, see Chande, Labelle and Tuer (2010).

7. Risks and regulation

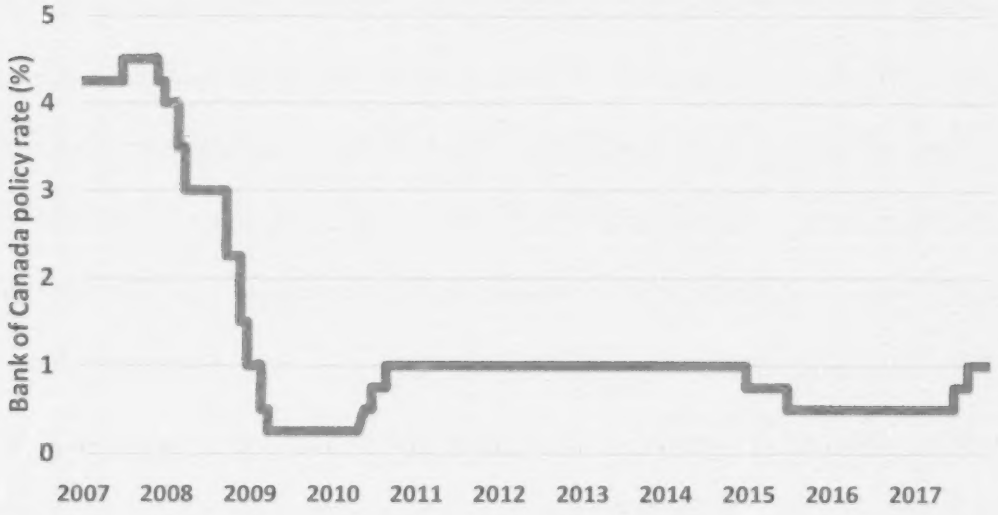
Risks

Financial risk is the possibility that the return on an investment will be lower than expected. Market participants and the government (as the debt issuer or borrower of funds) are mindful of the risks of owning GoC securities, which may affect their price. For GoC securities, the most relevant financial risks are interest rate risk, credit risk and liquidity risk.

Interest rate risk

Interest rate risk is the possibility of financial loss arising from movements in the market interest rate. As mentioned in section 5, there is an inverse relationship between the yield and the security's market price. For example, inflation significantly affects the interest rate, since the purchasing power of a fixed-income security decreases over time as the inflation rate rises. Inflation-linked securities, such as RRBs, mitigate this risk. Interest rates change over time with macroeconomic conditions. Indeed, the 2008–09 financial crisis pushed the Bank's policy rate close to zero per cent. **Chart 15** shows the Bank of Canada policy rate between 2007 and 2018

Chart 15: Historical Bank of Canada policy rate between 2007 and 2018



Source: Bank of Canada

Credit risk

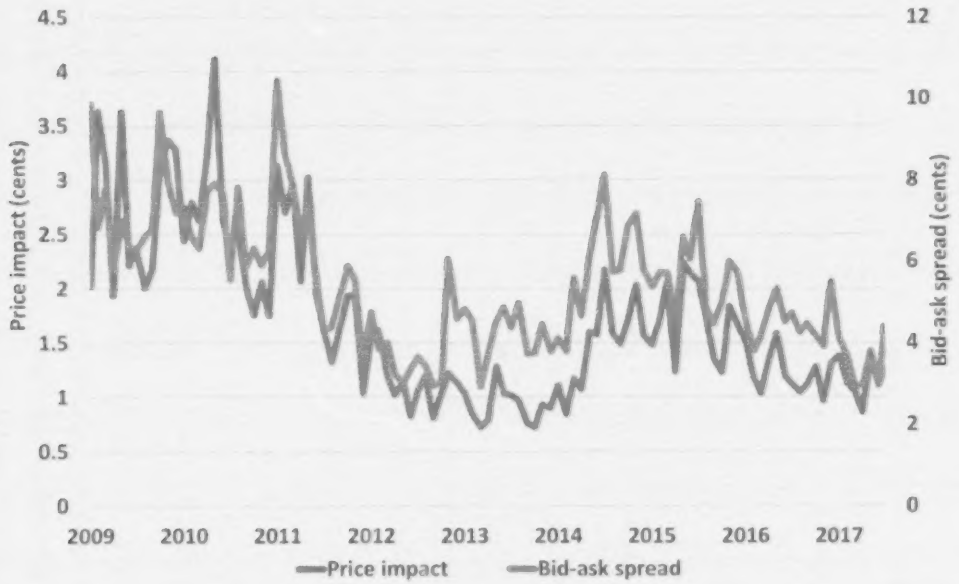
Credit risk is the possibility that a counterparty will be unable to meet its financial obligations on a debt security. This risk would arise if the government became likely to default on its future payment obligations to GoC bondholders. Currently, the government has an excellent credit rating, certified as "triple A" by the major credit-rating agencies, which are Standard and Poor's, Moody's, and Fitch. Canada's domestic debt has kept its high-quality, "triple A" credit rating, despite the 2008–09 financial crisis.

Liquidity risk

Liquidity risk is the possibility that a security may not be able to be traded quickly and in large amounts without affecting its market price. The prices of illiquid securities can be subject to sudden and significant changes because they tend to be traded infrequently and by a small number of dealers, resulting in high price impact. Gungor and Yang (2017) find that the liquidity of GoC securities has improved since the 2007–08 financial crisis and is consistent with historic norms.

Chart 16 shows the historical monthly price-impact (Amihud) and bid-ask proxies (Roll) for GoC bonds.[41] The price-impact proxy measures the impact of trade size on the GoC bond price. A high price-impact value indicates that large trade sizes have a greater impact on the price because they are less liquid. The bid-ask proxy measures the average transaction cost of all observed trades. The bid price is the price a buyer is willing to pay to buy the security, whereas the ask price is the price at which a seller is willing to sell it. A high bid-ask proxy indicates that the bond price varies widely between the bid and ask prices; these GoC bonds are less liquid.

Chart 16: Monthly price-impact and bid-ask proxies for Government of Canada bonds, 2009–17



Sources: Canadian Depository for Securities, CanDeal and Bank of Canada calculations

Regulation

Participants in the GoC securities market are subject to rules designed to promote market well-functioning, resilience to shocks and good financial conduct. In Canada, two regulators are responsible for the major rules that apply to participants in this market: the Canadian Securities Administrators (CSA) and the Investment Industry Regulatory Organization of Canada (IIROC).

[41] For further information about Amihud and Roll proxies, see Gungor and Yang (2017)

Canadian Securities Administrators (CSA)

The CSA is an organization that acts to improve, harmonize and coordinate the securities regulation of Canadian capital markets. It coordinates policy decisions among the securities commissions of each of the Canadian provinces to increase the uniformity of Canadian rules.

For the GoC securities market, the CSA acts as the licensing agency for any firm wishing to become a securities broker, dealer, adviser or marketplace.[42] As part of the licensing process, the firm is required to become a member of IIROC if its employees wish to be registered as dealers. In addition, the CSA coordinates regulations, most of which concern equity and derivatives markets. The CSA is moving to enhance its regulation of fixed-income markets (CSA Staff Notice 21-317). Currently, it has the objectives of coordinating work that

- increases post-trade transparency
- increases post-trade regulatory reporting, and
- studies access to the fixed-income market.

Investment Industry Regulatory Organization of Canada (IIROC)

IIROC is the Canadian securities-market self-regulator. It monitors and regulates all investment dealers and marketplaces in debt and equity markets in Canada. As a self-regulator, IIROC's board of directors is elected by its membership. IIROC monitors the behaviour of dealer firms in the securities market. As a condition of membership, dealer members agree to trade GoC securities in compliance with IIROC rules designed to prevent market abuse and to ensure market efficiency. The dealers must follow a Code of Conduct and comply with reporting requirements, trading and delivery requirements, and best-execution requirements.

Code of Conduct

The Code of Conduct provides guidance on the trading practices in the domestic fixed-income market and is designed to promote the market's integrity, efficiency and liquidity, as well as to promote public confidence and active trading. Dealers must observe high standards of ethics and act in good faith; avoid conflicts of interest regarding their trading activities; learn essential facts about customers before making recommendations; and never engage in fraudulent, deceptive or manipulative trading activities, such as artificial or *mala fide* trading, spreading rumours, trading ahead of client orders, or using information in client orders to profit. Dealer members must adhere to the Code of Conduct regardless of whether they are trading on their own or their customers' behalf.[43]

Reporting requirements

Since November 2015, IIROC dealer members are required to report trades on fixed-income securities (such as GoC securities) to IIROC's Market Trade Reporting System (MTRS).[44] The reporting system permits IIROC to monitor fixed-income trading activity in Canada.[45]

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[42] For further details about registration requirements, see NI 31-103 – Registration Requirements, Exemptions and Ongoing Registrant Obligations.

[43] To learn more about the IIROC Code of Conduct, see Rule 2800.

[44] For further information regarding MTRS reporting requirements, see Debt Securities Transaction Reporting MTRS 2.0 User Guide.

[45] For further details about IIROC Rule 2800C, see Transaction Reporting for Debt Securities.

Trading and delivery requirements

IIROC states rules governing how and when securities are delivered, as well as related conditions.[46] The seller of a security must adhere to a delivery schedule after the counterparties agree on the price and the quantity and have reported the transaction. For GoC securities, the schedule states that T-bills are delivered on the same day (T+0) and GoC bonds must be delivered two days later (T+2). Under the requirements, it is standard practice for the buyer of a bond to pay the seller compensation for interest accrued (but not yet paid) since the most recent coupon payment. In practice this is called the "dirty" price, and it compensates the seller for the time it has held the security since the most recent coupon payment.

Best-execution requirements

For clients trading fixed-income securities over-the-counter, the most common method for GoC securities, the dealer must provide in writing a disclosure of the policies and procedures it uses when executing trades, and these policies and procedures must fulfill IIROC's best-execution requirements.[47] Best execution means obtaining the most advantageous execution terms reasonably available under the circumstances. A dealer-to-client trade must be executed at a fair and reasonable price, including the commission. For example, if the client order is for an illiquid security, such as an off-benchmark GoC bond, dealers could survey other market participants about the security's price.

[46] For more information, see Rule 800.
[47] For more information, see Rule 3300.

References

Antoniewicz, R. and J. Heinreichs. 2014. "Understanding Exchange-Traded Funds: How ETFs Work." *Investment Company Institute.*

Arjani, N. and D. McVanel. 2006. "A Primer on Canada's Large Value Transfer System." Available at https://www.bankofcanada.ca/wp-content/uploads/2010/05/lvts_neville.pdf.

Bédard-Pagé, G., A. Demers and M. Tremblay. 2016. "Large Canadian Public Pension Funds: A Financial System Perspective." Bank of Canada *Financial System Review* (June): 33–38.

Bruneau, G., M. Leboeuf and G. Nolin. 2017. "Canada's International Investment Position: Benefits and Potential Vulnerabilities." Bank of Canada *Financial System Review* (June): 43–57.

Chande, N., N. Labelle and E. Tuer. 2010. "Central Counterparties and Systemic Risk." Bank of Canada *Financial System Review* (December): 43–50.

Duffie, D. and H. Zhu. 2016. "Size Discovery." Stanford University Graduate School of Business Research Paper No. 15-16.

Fabozzi, F. J. 2007 "Fixed Income Analysis." (John Wiley & Sons: Hoboken, NJ).

Fontaine, J.-S., J. Selody and C. Wilkins. 2009. "Improving the Resilience of Core Funding Markets." Bank of Canada *Financial System Review* (December): 41–46.

Garriott, C. and J. Johal. 2018. "Customer Liquidity Provision in Canadian Bond Markets." Bank of Canada Staff Analytical Note No 2018-12.

Garriot, C. and K. Gray. 2016. "Repo market ecology." Bank of Canada Staff Discussion Paper No 2016-8.

Gungor, S. and J. Yang. 2017. "Has Liquidity in Canadian Government Bond Markets Deteriorated?" Bank of Canada Staff Analytical Note No. 2017-10.

Hortacsu, A. and J. Kastl. 2012. "Valuing Dealers' Informational Advantage: A Study of Canadian Treasury Auctions." *Econometrica* 80(6): 2511–2542

Jordan, B.D. and Jordan, S.D., 1996. Salomon brothers and the May 1991 Treasury auction: Analysis of a market corner. *Journal of Banking & Finance*, 20(1), pp.25-40.

Kemplerer, P. 1999. "Auction Theory: A Guide to the Literature." *Journal of Economic Surveys* 13 (3): 227–86

Larson, M. and E. Lessard. 2011. "Developing a Medium-Term Debt-Management Strategy for the Government of Canada." *Bank of Canada Review* (Summer): 43–50.

McVanel, D. 2003. "CDSX: Canada's New Clearing and Settlement System for Securities." Bank of Canada *Financial System Review* (June): 59–64.

Pomorski, L., F. Rivadeneyra and E. Wolfe. 2014. "The Canadian Dollar as a Reserve Currency." *Bank of Canada Review* (Spring): 1–11.

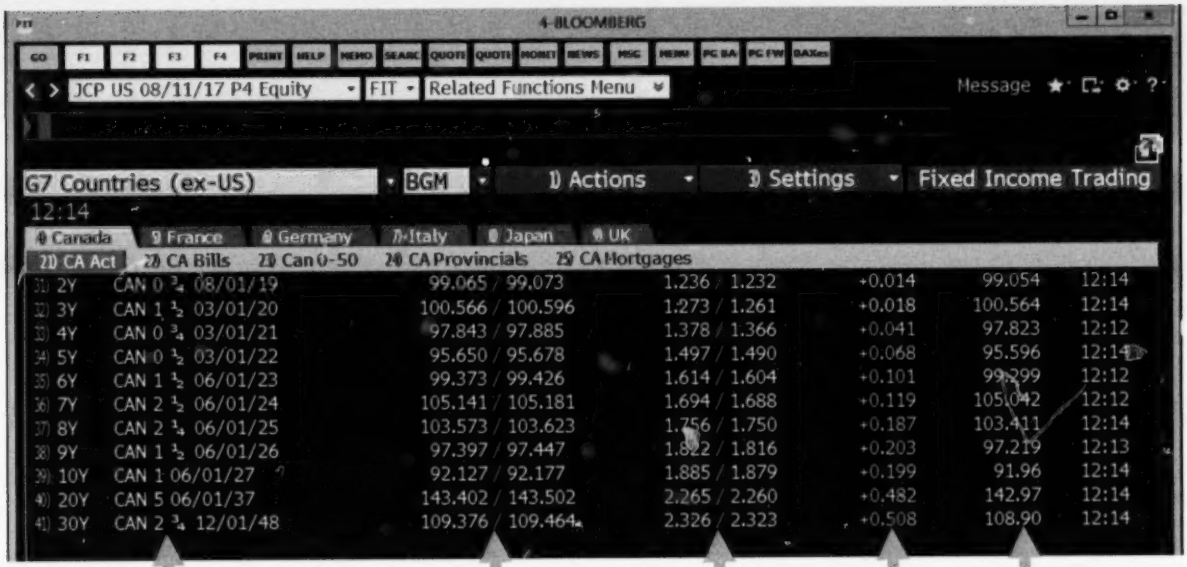
Ramirez, S. J. Sierra Jimenez and J. Witmer. 2015. "Canadian Open-End Mutual Funds: An Assessment of Potential Vulnerabilities." Bank of Canada *Financial System Review* (June): 47–55.

Vayanos, D. and P-O Weill. 2009. "A Search Based Theory of the On-the-Run Phenomenon." *The Journal of Finance* 63 (3): 1361–1398.

Appendix

A view of the market as seen from Bloomberg

Chart 17: Bloomberg screenshot of Canadian bond prices



Canadian bonds with their respective coupon rates and maturity dates

Bid-ask quotes for bonds

Bid-ask yields

Price changes from the day before

Yesterday's prices